(RETYPED)

APPLICATION				PART NUMBER	REV SYM H
NEXT ASSY	USED ON	SECT. NO	SERIAL NUMBER		
			PROTOTYPE	-1	
			PROTOTYPE	-2	
				-3	
				-4	
				-5	
				-6	
			PROTOTYPE	-7	
			PROTOTYPE	-8	
				-9	
				-10	
				-11	
				-12	
				-13	
				-14	
				-15	
				-16	

FOR APPROVALS AND CLEARANCES SEE D2-8200

(See 1a for continuation)

ONLY THE ITEM(S) LISTED ON THIS DRAWING AND IDENTIFIED BY VENDOR'S NAME(S), ADDRESS(ES), AND PART NUMBER(S), HAVE BEEN TESTED AND APPROVED BY THE BOEING COMPANY FOR USE IN X-20A

A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL BY THE BOEING COMPANY.

76202-720-301-00
76202-730-301-00
SOURCE CONTROL DRAWING

ORIGINAL SIGNED BY:

	DATE
DRAWN J. M. Cotton / R. S. Hill	6-1-61
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THE BOEING COMPANY
AERO-SPACE DIVISION SEATTLE, WASHINGTON

DYNA-SOAR EJECTION S[illegible]
AND SURVIVAL SYST[illegible]

CODE IDENT NO.	SIZE	
81205	A	10-31000
SCALE	AF 33(657)-7132	SH 1 OF 35

APPLICATION				PART NUMBER	REV SYM H
NEXT ASSY	USED ON	SECT NO	SERIAL NUMBER		
				-17	
				-18	
				-19	
				-20	

R

CODE IDENT NO.	SIZE	
81205	A	10-81000
SCALE	AF33(657)-7132	SH 1a of [illegible]

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
	PRR 9501 (variation) incorporated ADCN's as follows: ADCN 1 Added opt'l finish. Corrected paint color ADCN 2 Revised Rev. date of D2-80396 ADCN S3 Deleted upper arm supports ADCN S4 Added seat back tilt angle adjustment ADCN S5 Actuator, added -20 B0-2-0366 (variation) Revised attach hardware per customer request. (1) Changed suit to seat attach fittings to Koch & Sons P/N 015-10307 (CFAE) (2) Added Fig. 11 & changed Fig. 8 to prototype only. PRR 9500 (variation) DWG. clarification, relaxed voltage time requirements for tube cutter, reduced shoulder release fastener loads (Vendor request) (3) Revised Paragraph 1.2.1.9 to clarify initiator functions (4) Paragraph 3.2.13.2.3-1000 volts was 1500 volts. (5) Paragraph 3.2.13.2.5-20 milliseconds was 10 milliseconds. (6) Paragraph 3.2.23 Added clarification on GFP initiator usage. (7) Fig. 1 page 23 - clarified lower arm rest location. (8) Fig. 2 page 24 - added A6. & clarified ejection handle motions (9) Revised Paragraph 4.4.19.2 & 4.4.19.4 to clarify requirements. (10) Appendix B rewritten to clarify requirements. (11) Paragraph 1.2.1 Corrected part numbers (12) Paragraph 3.3.1.7.2 2250 lbs was 2575 lbs, 4500 lbs was 5150 lbs. (Loads should not have included survival kit weight).	10/3/3 9-26	DMB 9-19-3 Paul Ryan 9/20/3 J.W. Brown 9/23/3 F.J. Kittner 9/25/63 Spec 15-2-3 Pt 19-3-3
H			

CODE IDENT NO.	SIZE	
81205	A	10-81000
SCALE	AF 33(657)-7132	SH 2e

REV H

LIST OF ACTIVE PAGES AND CHANGE RECORD

ACTIVE PAGES			CHANGE RECORD		
REV	PAGE NUMBERS	ISSUE	REVISED	ADDED	DELETED
	[illegible]	[illegible]	[illegible]		
[illegible]	1 - 34		1 3 7-19 21-24 35	2a 13a 20a 31a	
C			1 3-4 5 -11 13 15-17 19-22 24 31 31a	2b 8a 10a 20a 20b 20c 20d 31b 31c [illegible]	
D			1 [illegible] 3 4 11 13a 14 15 21 22 23 31a	2c 21a 21b 35	
E			1 2c 3, [illegible] 5, [illegible] 8 -12 13a 17 19 20a 20b 21 21a 22 23 24 26 31 31a	17a 19a	6
F			1 3 5 8-10a 12, 8a 13a-15a 23a 31a 34 20-20d	2d 9a 14a 16a	
G			1 2d 3 5 8 8a 9 10 10a 13 14 15a 16 16a 19	1a	
H			1 1a 3 5 7, 8 8a-13a 15a 16a 17, 18 20b [illegible] 21a 21b [illegible] 23 24 31a 35	2e 31d 36	

[illegible] [illegible] AND SURVIVAL SYSTEM

10-83000

P NO. 3

DS 7315 7103 (WAS DAC 4574 C)

REV

REQD	PART NO.	DESCRIPTION	MATL	MATL SPEC	WT
1	-20	SEAT ASSEMBLY			
1	-19	SURVIVAL KIT			
1	-18	DISCONNECT ASSY, UPPER			
1	-17	DISCONNECT ASSY, LOWER			
1	-16	SEAT-MAN SEPARATOR INITIATOR			
1	-15	INERTIA REEL CARTRIDGE			
1	-14	SEAT-MAN SEPARATOR			
1	-13	SOFAR BOMB			
1	-12	TUBE CUTTER			
1	-11	HARNESS RELEASE INITIATOR			
1	-10	CATAPULT INITIATOR			
3	-9	INITIATOR			
1	-8	DISCONNECT ASSY, LOWER (PROTOTYPE ONLY)			
1	-7	DISCONNECT ASSY, UPPER (PROTOTYPE ONLY)			
1	-6	SEAT ASSEMBLY (PROTOTYPE ONLY)			
1	-5	FIXED RAIL ASSEMBLY			
1	-4	PARACHUTE ASSEMBLY			
1	-3	ROCKET CATAPULT ASSEMBLY			
1	-2	RESCUE & SURVIVAL KIT CONTAINER ASSEMBLY (PROTOTYPE ONLY)			
	-1	EJECTION SEAT AND RAIL ASSY (PROTOTYPE ONLY)			

LIST OF MATERIAL

DYNA-SOAR EJECTION SEAT AND SURVIVAL SYSTEM	BOEING AIRPLANE COMPANY	10-81000
		P NO. 5

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R

R

1.0 SCOPE

1.1 SCOPE.

This drawing covers the design, fabrication, performance and testing requirements for a type of equipment designated Ejection Seat and Survival System.

1.2 INTENDED USE AND ASSEMBLY BREAKDOWN

1.2.1 EJECTION SEAT AND SURVIVAL SYSTEM.

The specified ejection seat and survival system shall provide for pilot escape and survival from the Dyna-Soar glider in instances when a satisfactory landing site cannot be reached or when other conditions make an attempted glider landing impractical. The complete glider system consists of part numbers 10-81000-2, -3, -4, -5 & -9 thru -20. R

The upward ejection seat and rail assembly for the Dyna-Soar vehicle shall be patterned after existing state-of-the-art ejection seats. Size requirements for the pilot are based on a 5th to 75th percentile man, (maximum) fully dressed in a full pressure - body restraint suit system. The pilot's anthropometry shall comply with WADC Technical Report 52-321, "Anthropometry of Flying Personnel", dated September, 1954. A hinged seat back shall provide for two positions of flight; Boost, and Normal Flight/Ejection. A qualified Air Force back type parachute and a seat type rescue and survival kit shall be provided. Ejection sequencing shall be accomplished by actuating a two handed ejection control located on the front edge of the seat bucket between the pilot's legs. This action shall automatically pre-position and restrain the pilot for ejection, eject the hatch, provide system disconnect, supply the pilot suit with bailout oxygen, and fire a rocket catapult. After ejection, automatic seat/man separation shall be provided, with automatic parachute deployment at 14,000 feet or less.

1.2.1.1 EJECTION SEAT AND RAIL ASSEMBLY - 10-81000-1 - PROTOTYPE ONLY

The prototype seat and rail assembly shall be a complete system except for the -2 survival kit and -4 Parachute assembly. A dummy catapult and a complete set of dummy ballistic units shall be provided.

1.2.1.2 RESCUE AND SURVIVAL KIT CONTAINER ASSEMBLY. 10-81000-2 - PROTOTYPE ONLY R

The rescue and survival kit container assembly will include a bail-out oxygen bottle and regulator system, and will provide storage space for the life raft, rescue aids, and emergency survival equipment. The assembly shall be used as a seat cushion and parachute support during flight.

1.2.1.3 ROCKET CATAPULT ASSEMBLY. 10-81000-3

A qualified rocket catapult assembly will consist of the necessary energy for propelling the seat/man/survival equipment from the glider on a safe trajectory before parachute deployment.

1.2.1.4 PARACHUTE ASSEMBLY. 10-81000-4

A qualified type B-5 (C-9) or equivalent, back type parachute with modified attachments shall be provided with the ejection seat and survival system.

1.2.1.5 FIXED RAIL ASSEMBLY. 10-81000-5

The fixed rail assembly consists of the non-ejectable structure and associated hardware.

1.2.1.6 SEAT ASSEMBLY. 10-81000-6 PROTOTYPE ONLY
The seat assembly consists of the ejectable structure and associated hardware. R

1.2.1.7 DISCONNECT ASSEMBLY, UPPER. 10-81000-7 - PROTOTYPE ONLY
The upper disconnect assembly consists of the portion of the personal leads disconnect that is attached to the full pressure suit.

1.2.1.8 DISCONNECT ASSEMBLY, LOWER. 10-81000-8 - PROTOTYPE ONLY
The lower disconnect assembly consists of the portion of the personal leads disconnect that is attached to glider structure.

1.2.1.9 INITIATOR. 10-81000-9
The initiator is a cartridge actuated device which provides gas pressure for the hatch jettison pressure switch, hatch interlock, and seat back positioning actuation. R

1.2.1.10 CATAPULT INITIATOR. 10-81000-10
The catapult initiator is a cartridge actuated device which actuates the catapult.

1.2.1.11 HARNESS RELEASE INITIATOR. 10-81000-11
The harness release initiator is a cartridge actuated device which actuates the harness release system.

1.2.1.12 TUBE CUTTER. 10-81000-12
The tube cutter is a cartridge actuated device which cuts the catapult hose when the emergency external hatch release handle is operated.

1.2.1.13 SOFAR BOMB. 10-81000-13
The SOFAR bomb is a sound fixing and ranging bomb.

1.2.1.14 SEAT-MAN SEPARATOR. 10-81000-14
The seat man separator separates the pilot and the seat after ejection.

1.2.1.15 INERTIA REEL CARTRIDGE. 10-81000-15
The inertia reel cartridge operates the automatic re-wind on the inertia reel at ejection.

1.2.1.16 SEAT-MAN SEPARATOR INITIATOR. 10-81000-16
The seat-man separator initiator is a cartridge actuated device which actuates the seat-man separator.

1.2.1.17 DISCONNECT ASSEMBLY, LOWER. 10-81000-17
The lower disconnect assembly consists of the portion of the pilot's personal leads that mates with the -19 survival kit and is attached to glider structure.

1.2.1.18 DISCONNECT ASSEMBLY, UPPER. 10-81000-18
The upper disconnect assembly consists of the portion of the pilot's personal leads that mates with the -19 survival kit and is attached to the pilot's pressure suit.

1.2.1.19 RESCUE AND SURVIVAL KIT CONTAINER ASSEMBLY. 10-81000-19
The rescue and survival kit container assembly is identical to 10-81000-2 except that the pilot's personal leads shall be routed through the container.

1.2.1.20 SEAT ASSEMBLY. 10-81000-20
The seat assembly is identical to 10-81000-6 except that the seat back tilt angle adjustment actuator (paragraph 3.2.1.3) is included. R

2.0 APPLICABLE DOCUMENTS

2.1 GOVERNMENT. The following Government documents of the exact issue noted, together with the noted revisions thereto, constitute a part of this Source Control Drawing, but only to the extent defined herein. In those cases where the document listed is not dated, the issue in effect on the date of invitation for bids, shall form a part of this Source Control Drawing. When conflicting requirements exist, the requirements of this Source Control Drawing shall govern.

MIL-S-9479	Seat: Upward Ejection, Aircraft, dated 19 March, 1954
MIL-E-5272C	Environmental Testing, Aeronautical and Associated Equipment, General Specification For, dated 13 April 1959
Federal STD No. 595	Colors
WADC Technical Report 52-321	Anthropometry of Flying Personnel - 1950, dated September 1954
MIL-C-25918	Cartridge Actuated Devices, Aircraft Crew Emergency Escape, General Spec. For,
Air Force Drawing 52C-1543	Streamer Assembly, Warning
Air Force Drawing 55C-598	Streamer, Warning, Maintenance, Aircraft Escape Systems, Assembly Of
MIL-C-8514	Coating Compound, Metal Pretreatment, Resin-Acid
MIL-C-15328	Coating, Pretreatment, Formula No. 117 for Metals
MIL-E-5556	Enamel, Camouflage, Quick Drying
MIL-C-490	Cleaning and Preparation of Ferrous and Zinc Coated Surfaces for Organic Protective Coatings
MIL-A-8625A	Anodic Coatings, For Aluminum and Aluminum Alloys
MIL-M-10578B	Metal Conditioner and Rust Remover, Phosphoric Acid Base
TT-E-527	Enamel, Alkyd, Lustreless
TT-E-529	Enamel, Alkyd, Semi-gloss
MIL-C-5541	Chemical Films for Aluminum and Aluminum Alloys

(CONTINUED ON PAGE 9A)

2.1 GOVERNMENT. (CONTINUED)

MIL-S-5002	Surface Treatment (Except painting & priming) for Metal & Metal Parts in Aircraft. R

2.2 NON-GOVERNMENT. The following non-government documents and drawings of exact issues shown, form a part of this Source Control Drawing to the extent specified herein. In those cases where the document is not dated, the latest issue in effect on the date of invitation for bids shall form a part of this Source Control Drawing. One copy each of the documents listed below and marked with an asterik is to be furnished with each copy of this Source Control Drawing being sent to a vendor.

*D2-80396	General Requirements Document for X-20 Source Control Drawings and Design Procurement Specifications, Revision 2-19-63. R
*BAC-T11S	BAC Standard, Tape, Miscellaneous Systems, Identification
*BAC-T11AK-N1	BAC Standard, Tape, Compressed Gas System, Identification

3.0 REQUIREMENTS

3.1 GENERAL REQUIREMENTS

3.1.1 SUPPLEMENTAL DOCUMENT. Requirements, procedures, references, and definitions specified in Document D2-80396 form a part of this Source Control Drawing, except as noted herein. Where conflicting requirements exist, the requirements of this Source Control Drawing shall govern.

3.1.2 MIL SPECIFICATION COMPLIANCE. The general design and development requirements of MIL-S-9479 dated 19 March 1954 shall apply with the exception of deviations as written in this drawing.* In the event of conflict between this drawing and MIL-S-9479, the requirements of this drawing shall govern.

3.1.3 SYSTEM COMPATIBILITY. The ejection seat and survival system listed below shall be compatible and shall operate as an integrated system to perform the interrelated functions herein defined:

a.	10-81000-1	Ejection Seat and Rail Assembly (Prototype Only)
b.	10-81000-2	Rescue and Survival Kit Container Assembly (Prototype only)
c.	10-81000-3	Rocket Catapult Assembly
d.	10-81000-4	Parachute Assembly
e.	10-81000-5	Fixed Rail Assembly
f.	10-81000-6	Seat Assembly (Prototype Only)
g.	10-81000-7	Disconnect Assembly, Upper (Prototype Only)
h.	10-81000-8	Disconnect Assembly, Lower (Prototype Only)
i.	10-81000-9	Initiator
j.	10-81000-10	Catapult Initiator
k.	10-81000-11	Harness Release Initiator
l.	10-81000-12	Tube Cutter
m.	10-81000-13	SOFAR Bomb
n.	10-81000-14	Seat-Man Separator
o.	10-81000-15	Inertia Reel Cartridge
p.	10-81000-16	Seat-Man Separator Initiator
q.	10-81000-17	Disconnect Assembly, Lower
r.	10-81000-18	Disconnect Assembly, Upper
s.	10-81000-19	Rescue and Survival Kit Container Assembly
t.	10-81000-20	Seat Assembly

The requirements of this drawing shall be considered as applicable in the design of each of the assemblies listed above.

3.1.4 SYSTEMS INTEGRATION. The ejection and survival system shall be so designed that it will meet the performance requirements specified herein when integrated with the full pressure suit - body restraint system, escape hatch ejection system, and glider - pilot service connections. The ejection sequence shall conform to the sequence and integration shown in Figure 2.

* See Appendix A

3.1.5 PREPRODUCTION. This specification makes provisions for preproduction testing.

3.1.6 FINISH. All external non-operating surfaces shall be finished as follows:

Aluminum Alloys - Anodize per MIL-A-8625, or apply chemical film per MIL-C-5541. Apply one coat of wash primer per MIL-C-8514, or MIL-C-15328. MIL-C-5541 may be used in place of MIL-C-490.

Ferrous Alloys - Surface treatment per MIL-S-5002 followed by one coat of wash primer per MIL-C-8514, or MIL-C-15328. Optional: (Including corrosion resistant steel)-Clean per MIL-C-490, Grade II, Type 1, phosphoric acid etch per MIL-M-10578, or, when these methods are not practical, clean per MIL-C-490. Apply one coat of wash primer per MIL-C-8514, or MIL-C-15328.

In addition, the surfaces shall be given one coat of enamel conforming to one of the following specifications: TT-E-529, TT-E-527, or MIL-E-5556.

The color shall be gray, Color No. 36231 of Federal Standard No. 595, except as herein noted.

All component parts shall be finished to provide protection against electrolytic (galvanic) corrosion through contact of dissimilar metals, and corrosion from salt air or any other atmospheric condition that may be encountered, while properly functioning for the life of the article.

3.1.7 WEIGHT. The weight of the article shall be a minimum consistent with the performance requirements and within the limitations of sound design practice. It shall not exceed 397.0 pounds (total ejectable and non-ejectable weight). This weight includes the following:

a.	Pilot	176.0 lbs.
b.	Survival Container and Contents	40.0 lbs.

3.1.7 WEIGHT (CONTINUED)

c. Full Pressure Suit-Body Restraint System (including hose, electrical wiring and upper part of pilot services disconnect and bail-out oxygen). 32.5 lbs.

Monthly weight and balance reports shall be submitted as specified in D2-80396, "General Requirements Document for Dyna-Soar Source Control Drawings and Design Procurement Specifications."

3.2 SYSTEM DESIGN. The ejection seat and survival system shall be designed to provide a maximum degree of reliability of operation and require a minimum amount of maintenance. In addition, the seat shall be designed to provide maximum comfort, ease of adjustment (ground maintenance only), simplicity, durability, and minimum weight. Specifications and standard parts shall be selected per D2-80396.

3.2.1 SEAT ADJUSTMENT. The seat shall be designed to provide vertical adjustment and seat back tilt adjustment. Vertical adjustment of the seat will not be required in flight, but will be a preflight operation on the ground.

3.2.1.1 VERTICAL ADJUSTMENT. Preflight vertical seat adjustment shall provide 2.9 inches up, and 1 inch down from the normal seat reference point (SRP) as shown in Figure 1. Markings shall be provided so that it can be determined what position the seat is in from the forward side when installing the catapult in the fixed rails.

3.2.1.1.1 DELETED.

3.2.1.2 SEAT BACK TILT ADJUSTMENT. The seat back shall be designed to provide manual seat back tilt positioning. The seat positioning lever or control shall be located on the top of the left hand side panel in a convenient and readily accessible position to the pilot or ground crew. Seat back tilt shall provide two positions with stops, namely; "Boost" position $2^{\circ} \pm \frac{1}{2}^{\circ}$ forward of normal vertical, and "Ejection" position $13^{\circ} \pm \frac{1}{2}^{\circ}$ aft of normal vertical, as shown in Figure 1. The flight position may be selected anyplace between the two positions at the pilot's option. A seat position indicator shall be located in the L.H. arm rest. It shall have the 13 and 3 degree aft and the 2 degree forward positions marked.

For the ejection sequence, the seat back shall be automatically power actuated to the ejection position and locked in place by a ballistic powered actuator or similar device. Electric powered actuators or devices shall not be used. This function shall be included in the seat pre-ejection sequence. Automatic seat back positioning may be incorporated into inertia reel design (paragraph 3.2.6) eliminating the need for a separate seat back positioning actuator. Positioning of seat back to the ejection position under forward accelerations (eyeballs in) shall not result in pilot injury of any kind. Failure of automatic pre-ejection seat positioning shall not prevent seat ejection. (see Figure 2.)

3.2.1.3 SEAT BACK TILT ANGLE ADJUSTMENT ACTUATOR.(10-81000-20 only). R
A seat back tilt angle adjustment actuator shall be provided on the seat. This actuator shall be designed so that it will force the seat back forward under the full weight of suited 75th percentile pilot in the boost position and under the force of a pressurized suit in the flight position. The actuator shall be wholly contained within the seat envelope and shall be hand-operated by the pilot with the suit pressurized or unpressurized. This actuator supplements the requirements of paragraph 3.2.1.2.

3.2.2 EQUIPMENT INSTALLATION PROVISIONS. Installation provisions for a qualified B-5 back type personnel parachute assembly with modified attachments as outlined in paragraph 3.2.20, and a rescue and survival kit container assembly as outlined in paragraph 3.2.18, shall be provided in the ejection seat.

3.2.3 SEAT CUSHION. The seat cushion shall be included as part of the rescue and survival kit container assembly. The seat cushion covering material shall be sage green, USAF Color Shade No. 518.

3.2.4 PARACHUTE SUPPORT BULKHEAD. The aft end of the rescue and survival kit container assembly shall provide vertical support for the parachute.

3.2.5 FULL PRESSURE SUIT-BODY RESTRAINT SYSTEM, PARACHUTE AND SURVIVAL GEAR ATTACHMENT. Provisions shall be made for connection of the Full Pressure Suit-Body Restraint System (Government procured-bailment item) to the Ejection Seat and survival System. Two separate types of fittings are required and are as follows:

(1) Suit to Seat-Parachute-Survival Kit Attach Fittings (GFAE)

Two shoulder and two hip attach fittings are required for attaching the pressure suit to the ejection seat, parachute, and survival gear. They will be located on the pressure suit as shown in Figure 11.

All fittings are GFAE and will be furnished to the seat manufacturer. The harness fittings are Koch & Sons P/N 015-10307 "Attachable Body Assemblies (Female)." The harness assembly from suit to seat shall provide sufficient adjustment to enable the pilot to engage his four attach fittings and tighten the harness for restraint. R 1

(2) Seat to Suit-Parachute-Survival Kit Attach Fitting

Seat to suit-parachute-survival kit attach fittings shall be located to provide maximum restraint and pilot comfort. They shall be automatically disconnected after catapult rocket burnout but prior to man/seat separation. Automatic actuation of these fittings shall be accomplished by some type of gas cylinder energized by a delay initiator. The automatic release system shall be one direction, i.e., when fittings have opened for man/seat separation they cannot return to the closed position. The delay initiator shall be actuated as the seat travels up the ejection rails.

The initiator actuation mechanism shall be designed so that when the ejectable portion of the seat is installed on the fixed rails, the mechanism is automatically engaged. A device shall be provided which will allow manual removal of the ejection seat without firing the delay initiator.

A single manual release handle, easily accessible to either the pilot or the ground crew, shall release the seat from the suit, parachute and

3.2.5 Continued

(2) Continued

survival kit and parachute lanyard for emergency pilot egress. The pull force on this control shall be between 30 and 40 pounds to release the seat to suit-parachute-survival kit attach fittings with no load on the fittings. This handle shall be painted orange-yellow No. 33538, per Federal Standard No. 595. R

3.2.6 INERTIA REEL. An inertia reel shall be mounted on the seat back for shoulder restraint. The inertia reel shall restrain the pilot in the seat under high aft (eyeballs out) accelerations. Under normal conditions the inertia reel shall allow the pilot to assume the flight position. At initiation of the escape system, the inertia reel strap shall be automatically retracted, locking the pilot in the ejection position.

The inertia reel shall be easily accessible for servicing or replacement. The manual inertia reel lock control shall be located on the left hand side of the seat and shall be readily accessible to the pilot. The control handle shall be painted black No. 37038 per Federal Standard No. 595.

The inertia reel design may be such that it will also perform the function of seat back positioning outlined in paragraph 3.2.1, thus eliminating the need for a separate seat back positioning actuator.

3.2.7 MAN-SEAT SEPARATOR. After seat to suit-parachute-survival kit release, a positive means of separation of the pilot (with parachute and survival gear) from the ejection seat shall be provided. If the automatic man-seat release does not function the man-seat separator shall not be activated.

3.2.8 HEAD REST. The head rest shall be attached to the tilting back structure and shall remain stationary with respect to it when the seat back is tilted. The head rest shall be readily removable to reduce interference problems during pilot entry into the pilot compartment. Up and down head rest adjustment, and sufficient clearance, shall be provided to accommodate different size and shape pressure suit helmets. R

The contact surfaces of the head rest shall be padded with a high energy absorbing material. The color of the padded surfaces shall be maroon, No. 21136, per Federal Standard No. 595. Special attention shall be given to insure that the upholstery will withstand the wear and handling of normal service usage.

3.2.9 LEG SUPPORTS. Contoured leg supports shall be provided on the front of the ejection seat to support the calf of the pilot's leg during boost and ejection. These supports in conjunction with the rest of the seat configuration shall prevent the legs from spreading beyond the ejection envelope.

3.2.10 ARM SUPPORTS.

3.2.10.1 UPPER ARM SUPPORT. Arm supports shall not be provided. R

3.2.10.2 FOREARM SUPPORT. Forearm supports shall not be provided.

3.2.10.3 DELETED. R

3.2.11 DELETED. (Included in paragraph 3.2.1).

3.2.12 EMERGENCY EJECTION CONTROLS AND PROVISIONS

3.2.12.1 EJECTION CONTROL. The seat shall incorporate a two handed control, located on the forward edge of the seat bucket between the pilot's legs. The control shall be conveniently placed so that it may be easily reached for emergency ejection, when in the ejection or boost position and while the pilot is wearing an inflated full pressure-body restraint suit. The position of the control shall be such that it is not a safety hazard, either in flight or on the ground. The design of the control shall be such as to preclude inadvertent operation. The shape and location of the ejection control shall enable the pilot in a pressurized suit to positively grasp the control and initiate the ejection sequence. The handle shall be located approximately as shown in Figure 1. The actuation of this control shall provide an initiation signal for escape hatch ejection as well as the other ejection functions. The control shall have an interlock such that the ejection catapult cannot be fired until the hatch is jettisoned. (The hatch clears the ejection envelope in 100 milliseconds at .90 Mach and in 300 milliseconds at 70 knots at normal operation). The interlock signal shall be a ballistic type, operated by a lanyard attached to the hatch which fires an initiator mounted on vehicle structure. The seat Vendor shall furnish a tube disconnect on the R.H. rail as described in paragraph 3.2.13.3. The ejection control shall be painted alternate orange-yellow color No. 33538 and black No. 37038 stripes, per Federal Standard No. 595. The black stripe shall be 1/4" wide and the orange-yellow stripe 3/4" wide. The actuating force shall be 55 pounds minimum and 65 pounds maximum. R

3.2.12.2 ACTUATING LINKAGES. All linkages used for firing initiators shall be irreversible; i.e., it shall be impossible to fire any initiators except by the intended sequence of motions. Where initiators are employed in conjunction with the integrated full pressure-body restraint suit releases, shields or guards shall be employed to preclude the possibility of inadvertent firing. No unshielded cables or lanyards shall be used to actuate initiators. Push-pull type controls shall not be used unless they can meet the irreversibility requirement. All actuating mechanisms shall be so located or shielded that they will not tend to catch on clothing of pilot or servicing personnel, or to serve as hand holds. No linkage shall depend on locknuts to keep adjustment, but shall be non-adjustable or shall be pinned or otherwise permanently fastened after an initial adjustment for required travel.

3.2.12.3 DELETED.

3.2.13.2 CONTINUED

The initiator only shall meet the following requirements without the use of external shunts:

3.2.13.2.1 NO FIRE. It shall not fire as a result of the application of a direct current power of one watt for five minutes.

It shall not fire as a result of the application of a direct current of one ampere for five minutes.

3.2.13.2.2 INSULATION RESISTANCE. Insulation resistance shall be at least 100 megohms at 500 volts DC.

3.2.13.2.3 VOLTAGE BREAKDOWN. The initiator shall withstand 1000 Volts RMS between lead and case without breakdown. R

3.2.13.2.4 ALL FIRE. It shall fire with a current of 3.5 amperes at all temperatures between 35°F and 160°F.

3.2.13.2.5 OPERATING CURRENT. It shall fire within 20 milliseconds with a current of 5 amperes. R

3.2.13.2.6 RESISTANCE AFTER FIRING. The pin to case resistance after firing shall be 1000 ohms or greater.

3.2.13.2.7 ELECTROSTATIC DISCHARGE. It shall be designed to withstand a 150,000 erg discharge from a 500 mmfd condenser 10 times without firing.

3.2.13.2.8 SHOCK RESISTANCE. It shall be capable of being fired after dropping six feet onto concrete. It shall not self-fire when dropped 20 feet onto concrete.

3.2.13.2.9 OPERATING RESISTANCE. The internal circuit shall be designed to have a minimum of 5 amperes with an applied voltage of 12 volts DC.

3.2.13.3 HATCH INTERLOCK INTERFACE. A pneumatic disconnect fitting shall be mounted on the R. H. rail for the hatch interlock initiator. It shall be identical to, and furnished in the same manner, as the Escape Hatch interface disconnect, paragraph 3.2.13.1. The exact location shall be coordinated with The Boeing Company. The seat vendor shall furnish a -9 initiator.

3.2.13.4 SEAT EJECTED SWITCH INTERFACE. A striker ramp shall be provided on the aft flange of the R. H. rail to actuate the seat ejected switch as the seat travels up the rails. This switch relays a telemetry signal to the ground informing that the pilot has ejected from the glider. The switch will be mounted to glider structure and the ramp shall be designed so that when the ejectable portion of the seat is installed on the fixed rails it will automatically engage the switch. The exact location shall be coordinated with The Boeing Company.

3.2.18.2 CONTINUED.

such as shear pins or lockwire shall not be employed to hold the disconnect together. Crimp type electrical connectors shall be utilized wherever possible. The design of the disconnects and the associated fittings shall be closely coordinated with The Boeing Company as the overall design progresses. The survival kit will be designed such that upon ejection the bailout oxygen shall turn on automatically, and the kit shall remain attached to the parachute until the pilot pulls the disconnect handle during descent. Pulling the handle shall separate the upper disconnect and actuate the releases; further pull shall release the top of the container and inflate the life raft. The container and the life raft shall fall away from the pilot, both remaining attached to the drop line. The drop line can then be detached by the pilot. Pulling the handle prior to pulling the bottom disconnect shall release the kit from the pilot and separate the upper disconnect. There shall be a "green apple" control for manual bailout oxygen operation. The color of the container shall be sage green. (See Figure 11) R

3.2.19 ROCKET CATAPULT ASSEMBLY. A qualified rocket catapult assembly shall be integrated with the ejection seat and survival system configuration as shown in Figure 1. It shall be capable of ejecting the seat/man/survival system package to meet the performance requirements as listed in paragraph 3.4.

3.2.20 PARACHUTE ASSEMBLY. A qualified back type parachute shall be provided. This parachute shall be of the B-5 (C-9) type (or equivalent) with modified attachments to conform with the full pressure - body restraint suit and shall be integrated with the ejection seat and survival system configuration as shown in Figure 8. It shall provide automatic deployment after seat man separation at ejections of 14,000 feet altitude or less, and will allow free fall to 14,000 feet before automatic deployment for higher altitudes of escape.

3.2.21 SOFAR (SOUND FIXING AND RANGING) BOMB. A SOFAR bomb shall be installed in a convenient location on the ejection seat structure to aid in location and rescue. The SOFAR bomb shall have a range capability up to 3000 miles and shall have a depth setting of 3500 feet.

3.2.22 TUBING IDENTIFICATION. Each tube shall have an identifying tape installed at each end. The tape shall have the same data printed on it as the metal-cal which identifies the part it connects to, similar to BAC-T11S. In addition, each tube shall have a tape with the tube part number and one with the system identification installed at each end. These tapes shall conform to BAC-T11S-H5 and BAC-T11AK-N1.

3.2.23 POWDER ACTUATED DEVICES. All powder actuated devices shall conform to MIL-C-25918 except that paragraph 3.4.11.3 is not applicable. In the event that GFP units are utilized, the vendor shall notify Boeing of the P/N & quantities required so that Boeing may arrange procurement. The vendor shall be responsible for the integration & qualification of the units. R

3.3 EJECTION SEAT AND SURVIVAL SYSTEM CONSTRUCTION

3.3.1 STRENGTH REQUIREMENTS. All ultimate loads specified in the following sub-paragraphs are 1 1/2 times the proof loads and are based on a weight of 397 pounds maximum as specified in paragraph 3.1.7. All design conditions are to be considered with the seat back both full aft and full forward, except as noted. R

3.3.1.1 EJECTION LOADS

3.3.1.1.1 PERSONNEL CATAPULT LOAD. The ejection seat and survival system shall withstand an ultimate load of 1 1/2 times the maximum catapult thrust applied downward parallel to the centerline of the rollers or slide blocks and through the combined center of gravity of the seat occupant with the seat adjusted to the most structurally critical position. In determining the combined center of gravity, the center of gravity of the seat occupant may be considered as being 11 inches forward (measured parallel to the seat bucket bottom) and 9 inches above (measured parallel to the seat back) the seat reference point. See Figure 1. The load shall be transferred to the seat bottom.

3.3.1.1.2 AIR LOAD. The ejection seat and survival system shall withstand an ultimate ejection air load of 1 1/2 times the force imposed upon the seat and its occupant, created by the wind blast from ejection at a "q" of 900 pounds per square foot dynamic pressure. This force shall be applied parallel to the glider waterline and through the combined center of pressure of the exposed portion of the seat and its occupant, distributed over that portion of the seat back exposed to the air stream. For application of this load, the seat shall be positioned with the minimum amount of controlled engagement with the fixed rails. The air load shall be applied with the personnel catapult load applied as noted in paragraph 3.3.1.1.1, except this load shall be the load the catapult would exert with the seat at this position in the rails. The top glider contour in the region of the seat rails is shown in Figure 1. The tilting seat back assembly need not be designed to take these loads in the forward position if a "controlled failure" is provided. This "controlled failure" (allowing the seat back to move aft against the rails) shall not result in pilot injury. The failure point shall be above vehicle boost loads.

3.3.1.1.3 VEHICLE LOAD FACTORS. During ejection, the ejection seat and survival system shall withstand an ultimate load of 1 1/2 times the following vehicle limit load factors.

(a) $\pm$ 2.5 normal to glider $\mathcal{E}$ (+ down)

(b) - 1.8 longitudinal (+ forward)

These loads shall be applied with the seat in the position noted in paragraph 3.3.1.1.2. In addition, they shall be applied with the air load specified in paragraph 3.3.1.1.2 and with and without the catapult load specified in paragraph 3.3.1.1.1.

3.3.1.2 DELETED.

3.3.1.3 BOOST LOAD. The ejection seat and survival system shall withstand a 10.5 "g" ultimate load applied aft, parallel to the longitudinal centerline of the glider. The seat shall be adjusted to its most critical position for application of this load.

3.3.1.5 EJECTION CONTROL. The ejection control shall be capable of withstanding a load of 500 pounds ultimate, applied at the center of the gripping surface. This load shall be applied in the direction of normal actuation.

3.3.1.6 HEAD REST. The head rest shall withstand a load of 500 pounds ultimate, applied aft in a direction parallel to the seat bottom.

3.3.1.7 RELEASE FASTENERS.

3.3.1.7.1 HIP RELEASE FASTENERS. Each hip release fastener shall withstand an ultimate load of 4125 pounds.

3.3.1.7.2 SHOULDER RELEASE FASTENERS. Each shoulder release fastener shall withstand an ultimate load of 2250 pounds or the resultant of a total ultimate load of 4500 pounds for shoulder restraint. R

3.3.2 CRASH LOADS. All ultimate loads specified in the following sub paragraphs are 1 1/2 times the proof load and are based on the weights specified in paragraph 3.3.1.

3.3.2.1 FORWARD. The ejection seat and survival system shall withstand 40 "g" ultimate load applied forward parallel to the longitudinal centerline of the glider. The seat shall be in the most structurally critical position of adjustment.

3.3.2.2 SIDE. The ejection seat and survival system shall withstand a 40 "g" ultimate load applied 20° to either side of the forward direction. This results in a 37.6 "g" ultimate forward load and a 13.7 "g" ultimate side load.

3.3.2.3 DOWNWARD. The ejection seat and survival system shall withstand a 20 "g" ultimate load applied downward normal to the longitudinal centerline of the glider. The seat shall be adjusted to the most structurally critical position of adjustment.

3.3.2.4 UPWARD. The ejection seat and survival system shall withstand a 10 "g" ultimate load applied upward normal to the longitudinal centerline of the glider. The seat shall be adjusted to the most structurally critical position of adjustment.

3.4 SYSTEM PERFORMANCE

3.4.1 EJECTION SEAT. The ejection seat shall perform satisfactorily within the altitude velocity pressure limits prescribed in the escape envelope shown in Figure 3. Mach 0.9, or a velocity equivalent to a dynamic pressure of 900 psf, has been set as the upper velocity limit. It is possible that a system meeting the low altitude requirements can exceed the Mach 0.9 limit at higher altitudes. The specified upper limits of operation will be expanded accordingly, if design analysis so justifies. At the low velocity end of the envelope, a zero speed capability is desirable and has been established as a design objective. The specific low speed design requirements have been established as 70 knots equivalent air speed at zero altitude.

Seat ejection trajectory shall provide a minimum of three feet of clearance from the interference path of the B-52 carrier aircraft wing, for the performance conditions shown in Figure 4. This requirement will satisfy clearance requirements

4.4.2 SEAT ADJUSTMENT TEST. Demonstrate the ability of the seat to meet the positioning requirements of paragraph 3.2.1 through 3.2.1.3.

4.4.3 PILOT RELEASE SYSTEM TEST. Demonstrate the ability of the harness release system to meet the requirements of paragraph 3.2.5.

4.4.4 INERTIA REEL TEST. Demonstrate the ability of the inertia reel to meet the requirements of paragraph 3.2.6.

4.4.5 MAN-SEAT SEPARATOR TEST. Demonstrate the ability of the man-seat separator to meet the requirements of paragraph 3.2.7.

4.4.6 HEAD REST. Demonstrate the ability of the head rest to meet the requirements of paragraph 3.2.8.

4.4.7 EJECTION CONTROLS TEST. Demonstrate the ability of the ejection controls to meet the requirements of paragraph 3.2.12.

4.4.8 SEAT CATAPULT DEACTIVATION TEST. Demonstrate the ability of the seat catapult deactivation device to meet the requirements of paragraph 3.2.13.2.

4.4.9 SOFAR BOMB TEST. Demonstrate the ability of the SOFAR bomb to meet the requirements of paragraph 3.2.21.

4.4.10 STRUCTURAL TEST. Demonstrate the ability of the seat to withstand the ultimate loads specified in paragraph 3.3 without failure.

4.4.11 ZERO VELOCITY TEST. At least one static ground firing shall be conducted to investigate the zero velocity capabilities of the system.

4.4.12 HIGH TEMPERATURE TEST. The assembly shall be tested per paragraph 4.1.2 of MIL-E-5272C, except that the cartridge actuated devices shall soak for a period of three hours after their cases have reached the test temperature. The assembly shall be operated while still at test temperature.

4.4.13 LOW TEMPERATURE TEST. Testing is not required.

4.4.14 VIBRATION TEST.

4.4.14.1 TEST INSTALLATION. The equipment shall be mounted on a suitable vibrator using a rigid fixture. The attachment to the fixture shall be identical to the service installation. The fixture shall be sufficiently rigid to eliminate fixture resonances in the test frequency range, if possible. Provisions shall be made to monitor the input vibrations at the equipment mounting points.

The weight of the assembly and of the vibrator table plus fixture, brackets, etc., shall be determined and entered in the test report.

The installation shall be balanced if necessary to minimize rocking of the vibrator table or test fixture.

4.4.14.2 INSTRUMENTATION REQUIREMENTS. For all vibration tests, monitor accelerometers shall be mounted at two or more of the points of attachment of the test item to its brackets or fixture, with sensing axes parallel to the vibrator motion. These accelerometers shall be monitored continuously during the tests,

4.4.19 CONTINUED

Boeing of all test data as soon as available from AFMDC.

A final and detailed test report will be required, suitable for demonstration of the performance qualification of the complete ejection system. Boeing will perform any added final reporting required for the hatch & heatshield systems.

The test contractor will be responsible for test area cleanup, disposition, and any required shipment of test equipment.

4.4.19.1 The sled test program will consist of the following minimum requirements. Four ejection seat runs will be planned. Three runs will be accomplished (one each) at velocities of 70 K, 400 K and 510 knots. They do not necessarily have to proceed in this order. The fourth run will be reserved for accumulated pick-up items, or possible ejection under acceleration, simulating direct ejection during boost. One sled drag calibration run will be planned prior to any test runs.

4.4.19.2 The following items shall be demonstrated and/or verified during the sled test program:

(1) Demonstrate that seat ejection and hatch jettison occur in proper sequence as shown on figure 2.

(2) Verify that the seat ejection envelope clearance is within the limits specified in paragraph 3.4.1.

(3) Verify that the escape hatch and ejection seat trajectories satisfy the design trajectories.

(4) Demonstrate that complete parachute deployment and inflation occurs in sufficient time to insure pilot safety.

(5) Demonstrate that the dynamic effects on the pilot (anthropometric dummy) are within the specified design requirement limits.

4.4.19.3 Boeing will furnish the test sled vehicle. Boeing will also supply all instrumentation sensors or components that must be integral with Boeing furnished components or sled structure. In addition, all provisions for instrumentation, power supply, camera mounts and access will be supplied with Boeing items in so far as is feasible.

The AFMDC Track Test Division will supply the sled vehicle slippers, and the rocket pusher/water brake sled.

The test contractor will supply all other test items and equipment, including instrumentation, not available from AFMDC. The instrumentation requirements will be worked out between the test contractor and AFMDC, incorporating Boeing furnished requirements for the hatch & heatshield systems.

4.4.19.4 The escape hatch will be tested on all ejection seat sled runs and will be initiated by the normal ejection seat system. Test hardware, special tools and installation instructions will be provided by The Boeing Company.

4.4.19.4 (Continued)

Instrumentation shall consist of, but not be limited to, the following:

(1) Time referenced data on seat and hatch motion and trajectory for at least the first thirty feet of hatch trajectory and entire ejection sequence shall be obtained by the following cameras:

a.) Metric range camera
b.) Sled camera mounted in glider nose - 1000 frames/sec, 100 feet film (minimum).
c.) Cockpit mounted camera - 1000 frames/sec, 100 feet film (minimum).

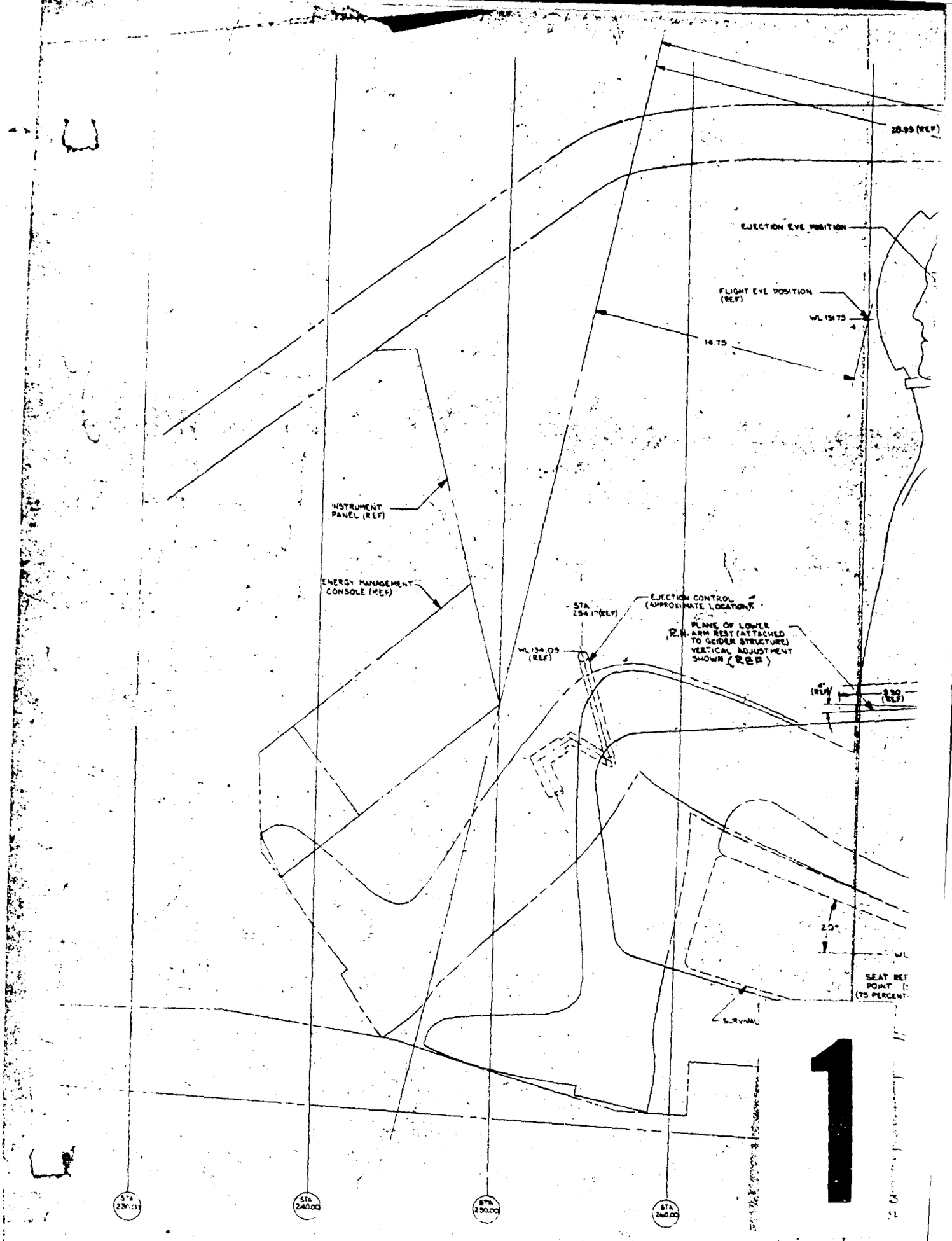
(2) Firing simultaneity of 20 initiators, current operated, time oriented. Instrumentation response accuracy to space/time reference shall be within 1 millisecond.

(3) Time to complete four (4) inch thruster stroke, ±2 millisecond response accuracy to space/time reference.

(4) Fastener functioning time to complete piston travel, ±2 millisecond response accuracy to space/time reference.

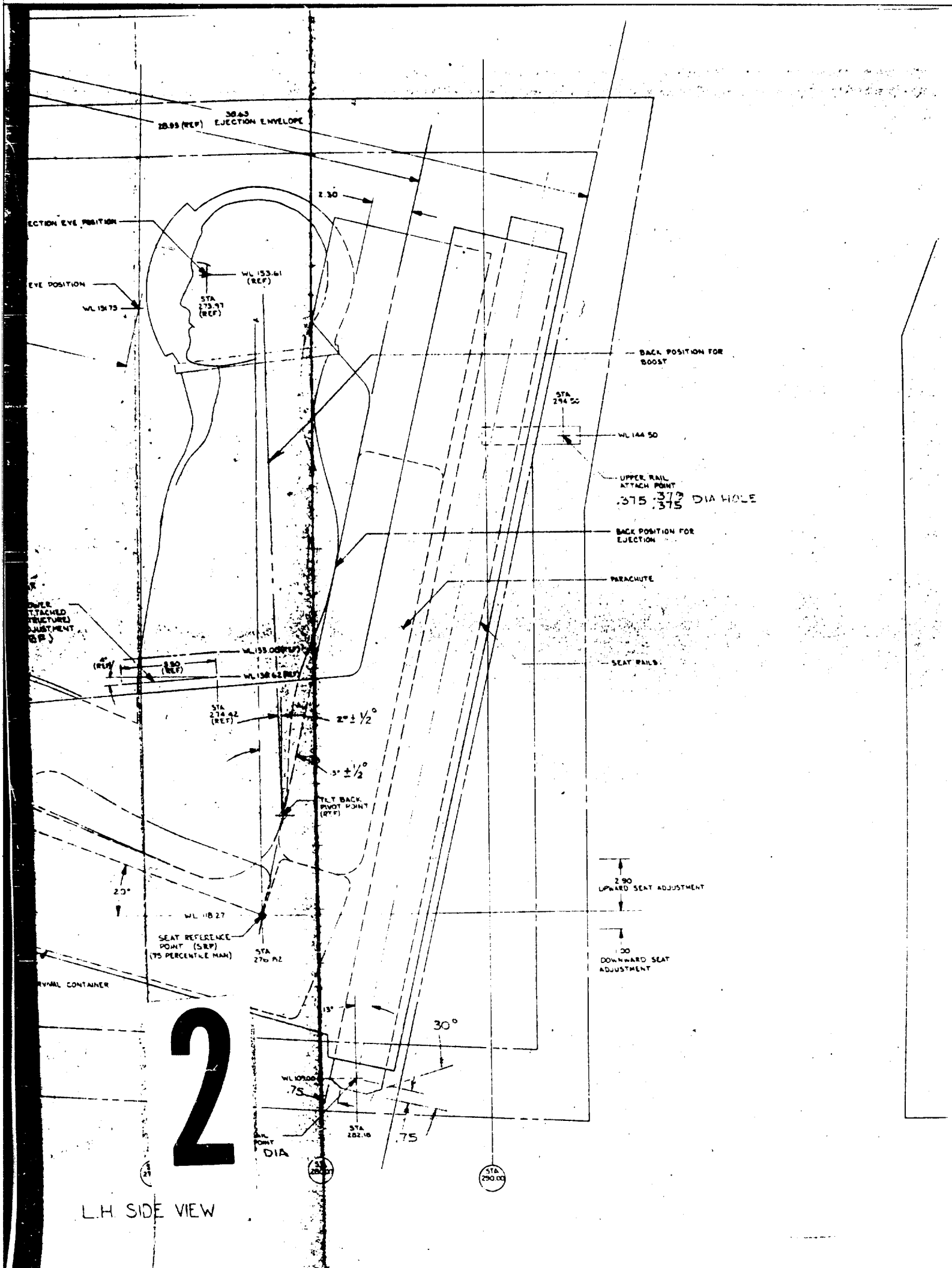
(5) Thruster chamber pressure, 0-5000 psi, ±50 psi tolerance. Instrumentation response accuracy to space/time reference shall be within 2 milliseconds.

4.4.19.5 The Vendor shall supply the necessary quantities of ejection seat and survival systems described in this document, and anthrompomorphic dummy to support these tests. The anthropomorphic dummy shall be of a 75th percentile in accordance with WADC Technical Report No. 52-321, dated September 1954.


EJECTION EYE POSITION
FLIGHT EYE POSITION (REF)
WL 134.75
14.75
INSTRUMENT PANEL (REF)
ENERGY MANAGEMENT CONSOLE (REF)
STA 234.17 (REF)
EJECTION CONTROL (APPROXIMATE LOCATION)
PLANE OF LOWER ARM REST (ATTACHED TO SEIDER STRUCTURE) VERTICAL ADJUSTMENT SHOWN (REF)
WL 134.05 (REF)
20°
STA 230.00
STA 240.00
STA 250.00
STA 260.00

1

L.H. SIDE VIE


38.63
28.93 (REF) EJECTION ENVELOPE
2.30
ECTION EYE POSITION
EYE POSITION
WL 153.61 (REF)
STA 273.97 (REF)
WL 154.73
BACK POSITION FOR BOOST
STA 294.50
WL 144.50
UPPER RAIL ATTACH POINT
.375 .379 .375 DIA HOLE
BACK POSITION FOR EJECTION
PARACHUTE
SEAT RAILS
WL 133.00 (REF)
WL 138.62 (REF)
STA 274.42 (REF)
2° ± ½°
5° ± ½°
TILT BACK PIVOT POINT (REF)
2.90 UPWARD SEAT ADJUSTMENT
1.00 DOWNWARD SEAT ADJUSTMENT
20°
WL 118.27
SEAT REFERENCE POINT (SRP) (95 PERCENTILE MAN)
STA 276.82
15°
30°
WL 109.00
.75
STA 282.16
.75
STA 290.00
2
L.H. SIDE VIEW

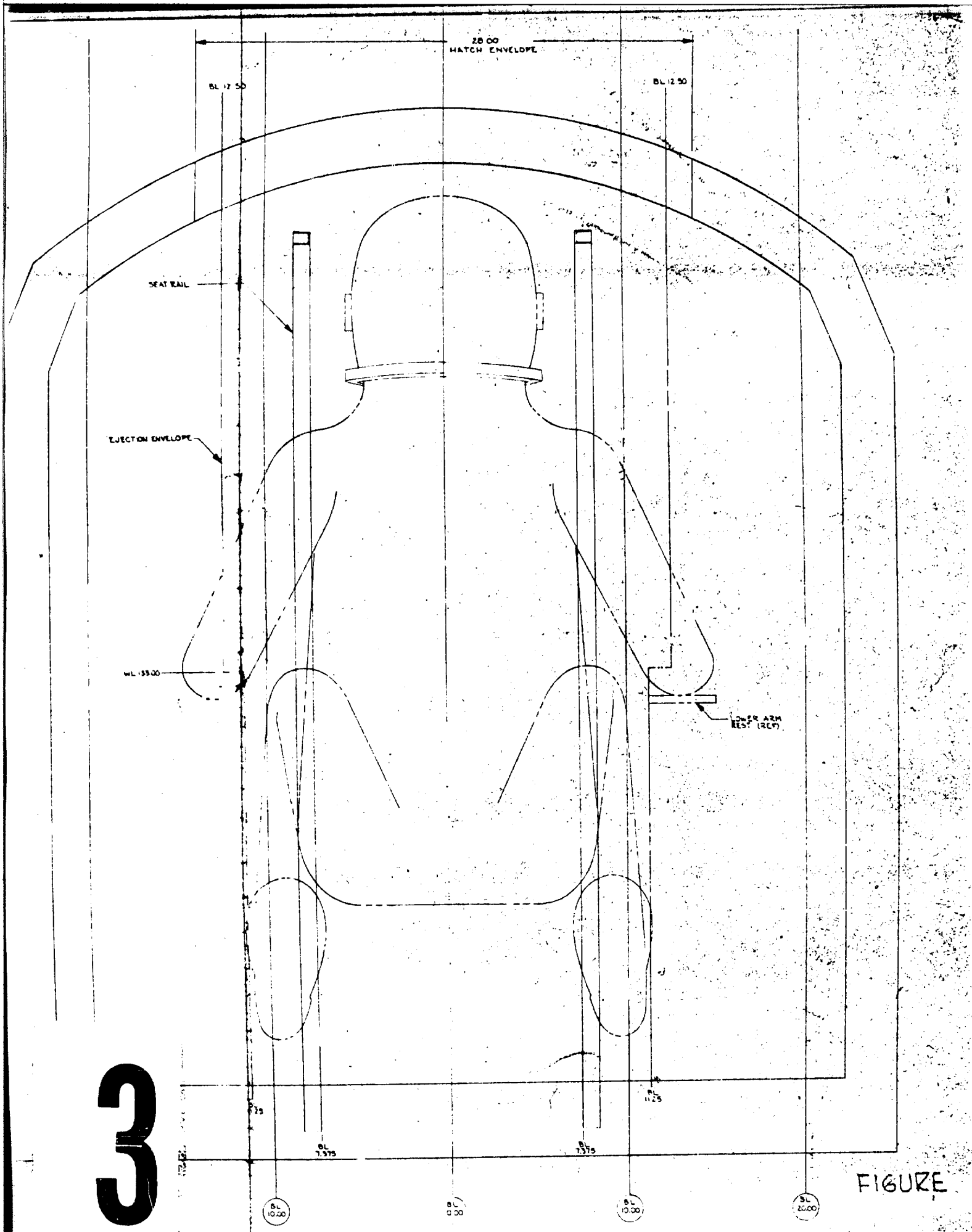
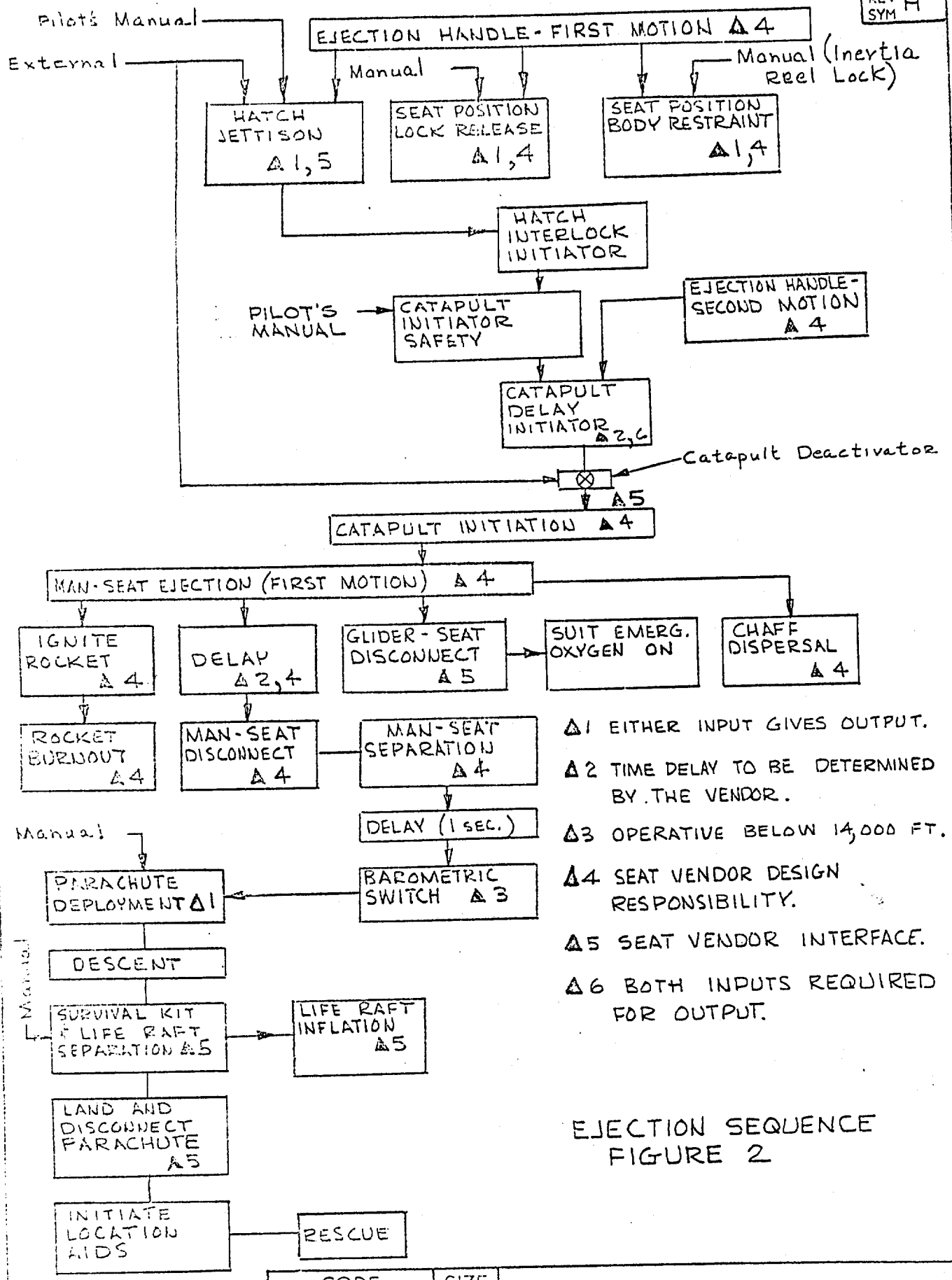


FIGURE 3

REAR VIEW

REV SYM H



Δ1 EITHER INPUT GIVES OUTPUT.

Δ2 TIME DELAY TO BE DETERMINED BY THE VENDOR.

Δ3 OPERATIVE BELOW 14,000 FT.

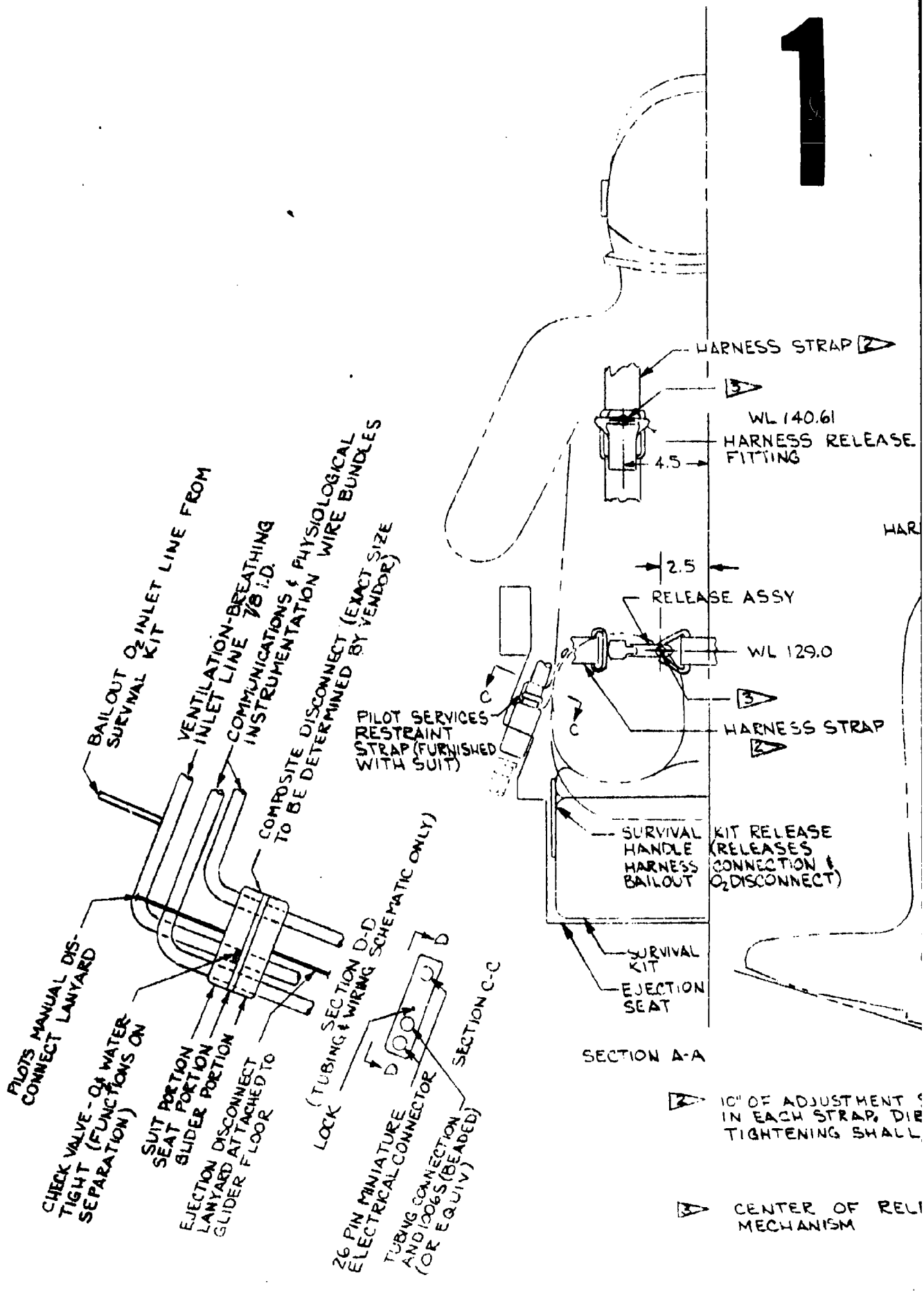
Δ4 SEAT VENDOR DESIGN RESPONSIBILITY.

Δ5 SEAT VENDOR INTERFACE.

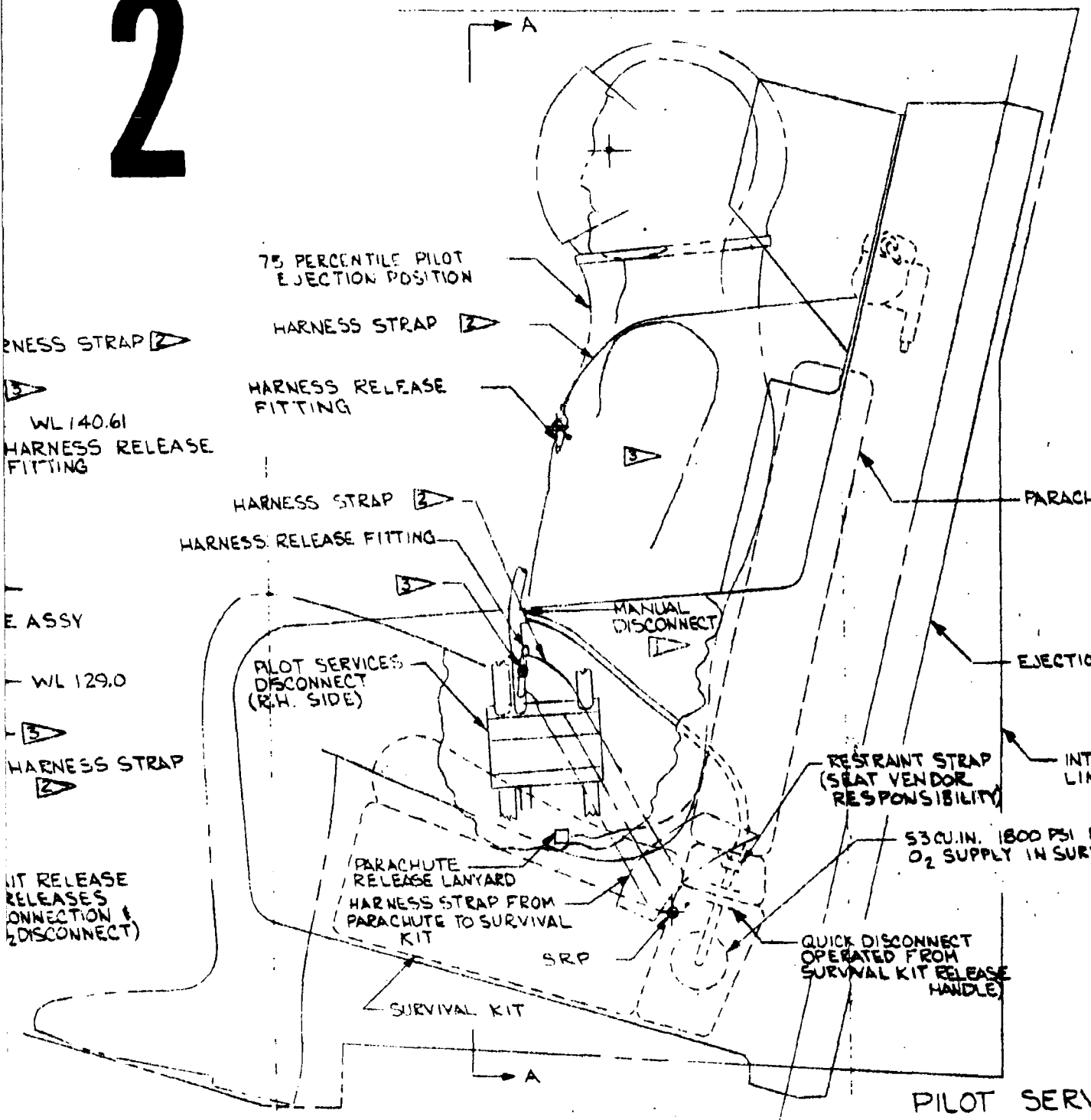
Δ6 BOTH INPUTS REQUIRED FOR OUTPUT.

EJECTION SEQUENCE
FIGURE 2

CODE IDENT NO.	SIZE	
81205	A	10-81000
SCALE	AF33(657)-7132	SH 24


1
HARNESS STRAP
WL 140.61
HARNESS RELEASE FITTING
4.5
2.5
RELEASE ASSY
WL 129.0
HARNESS STRAP
SURVIVAL KIT RELEASE HANDLE (RELEASES HARNESS CONNECTION & BAILOUT O2 DISCONNECT)
SURVIVAL KIT
EJECTION SEAT
SECTION A-A
BAILOUT O2 INLET LINE FROM SURVIVAL KIT
VENTILATION-BREATHING INLET LINE 7/8 I.D.
COMMUNICATIONS & PHYSIOLOGICAL INSTRUMENTATION WIRE BUNDLES
COMPOSITE DISCONNECT (EXACT SIZE TO BE DETERMINED BY VENDOR)
PILOT SERVICES RESTRAINT STRAP (FURNISHED WITH SUIT)
PILOTS MANUAL DISCONNECT LANYARD
CHECK VALVE - O2 WATER TIGHT (FUNCTIONS ON SEPARATION)
SUIT PORTION SEAT PORTION GLIDER PORTION
EJECTION DISCONNECT LANYARD ATTACHED TO GLIDER FLOOR
LOCK (TUBING & WIRING SCHEMATIC ONLY)
SECTION D-D
SECTION C-C
26 PIN MINIATURE ELECTRICAL CONNECTOR
TUBING CONNECTION AN1006S (BEADED) (OR EQUIV)
2 10" OF ADJUSTMENT IN EACH STRAP, DIE TIGHTENING SHALL
3 CENTER OF REL MECHANISM

2



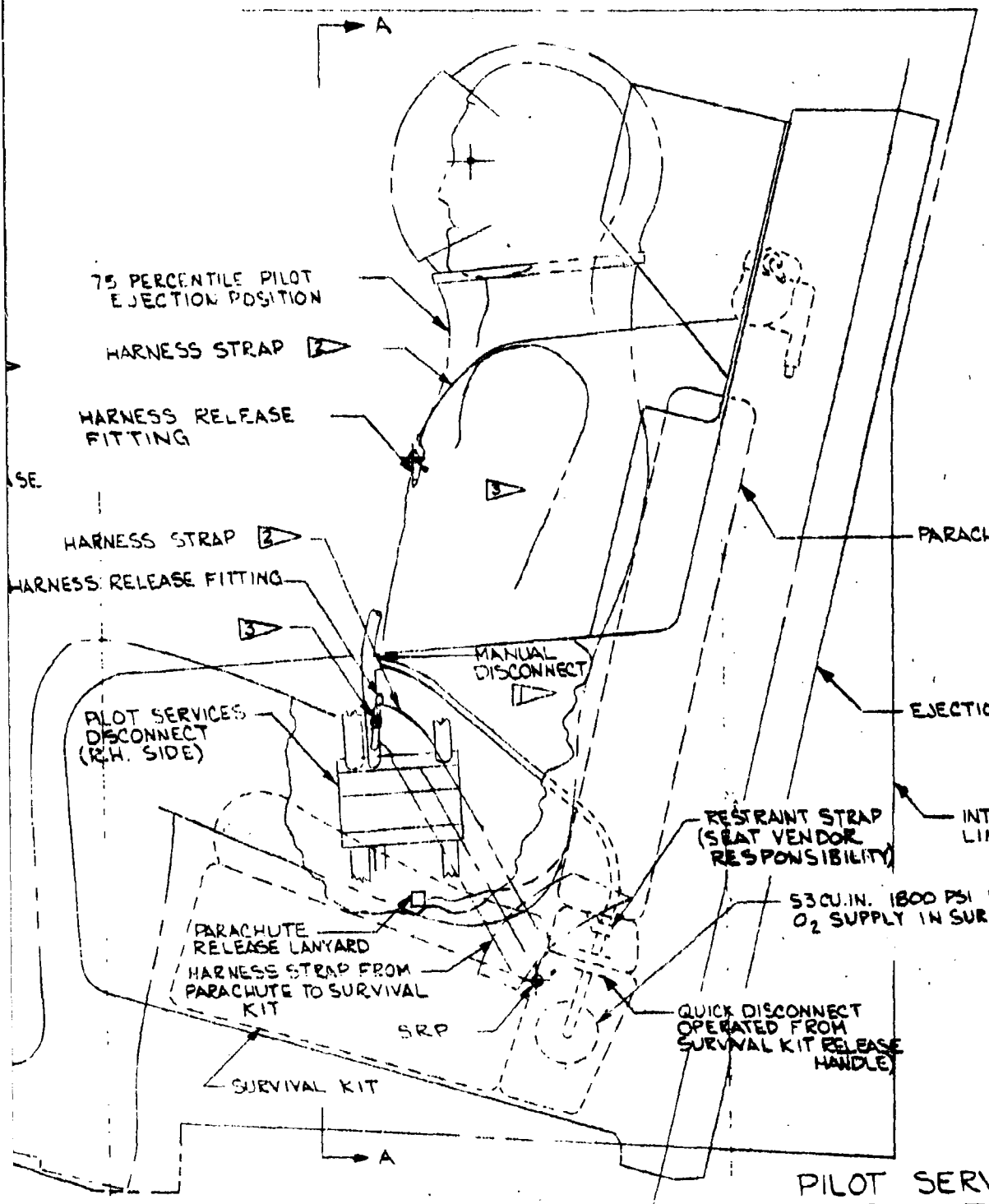
PILOT SERVICES AND
RESTRAINT REQUIR
(PROTOTYPE ONLY
FIGURE 8

10" OF ADJUSTMENT SHALL BE PROVIDED IN EACH STRAP. DIRECTION OF PULL FOR TIGHTENING SHALL BE FORWARD

1 SUIT MANUFACTURER SHALL PROVIDE PART NUMBER & ENTRY LOCATION

CENTER OF RELEASE LOCK MECHANISM

3

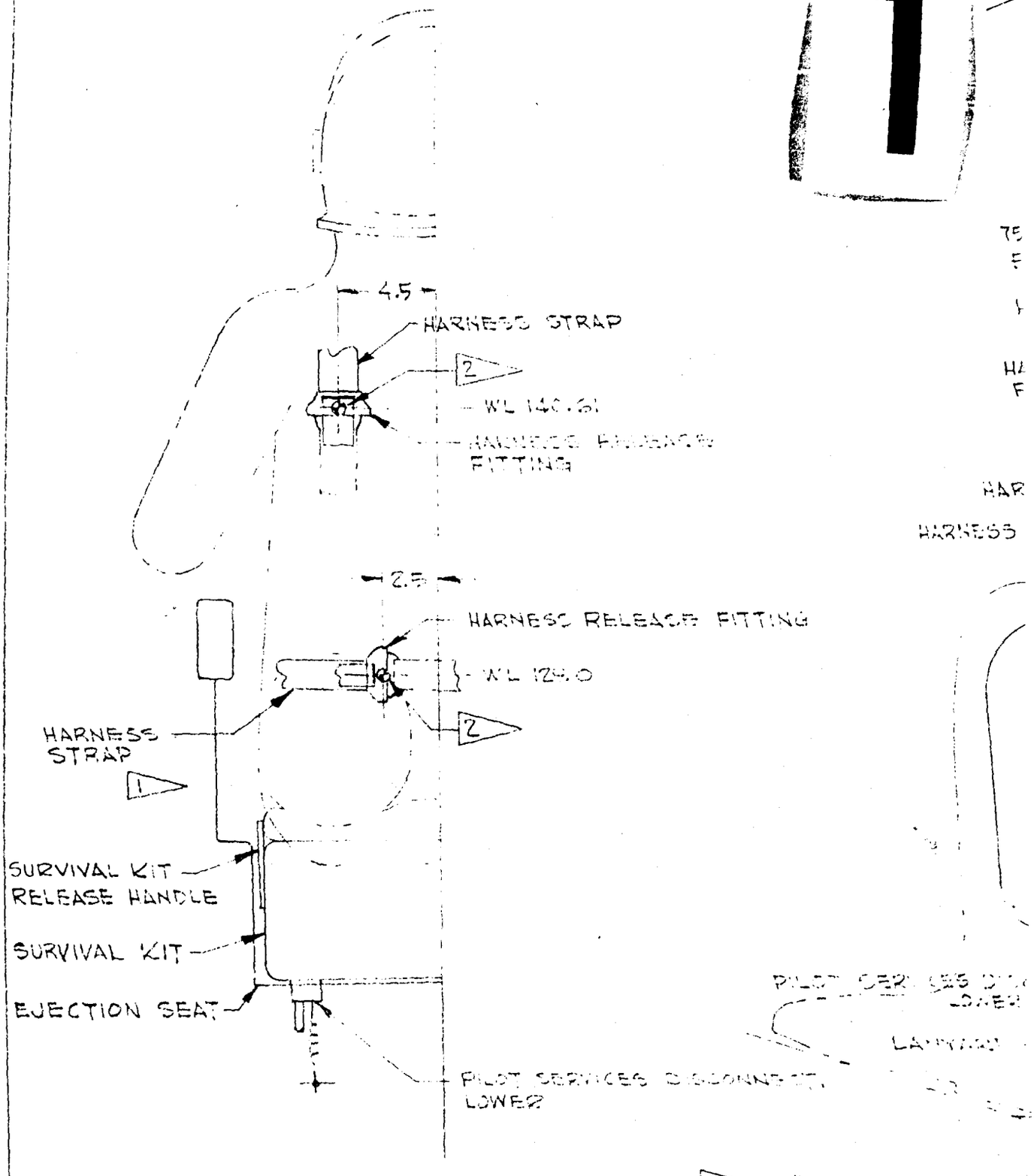


PILOT SERVICES AND RESTRAINT REQUIREMENTS
(PROTOTYPE ONLY)
FIGURE 8

NT SHALL BE PROVIDED
DIRECTION OF PULL FOR
ALL BE FORWARD

1 SUIT MANUFACTURER SHALL PROVIDE PART NUMBER & ENTRY LOCATION

RELEASE LOCK

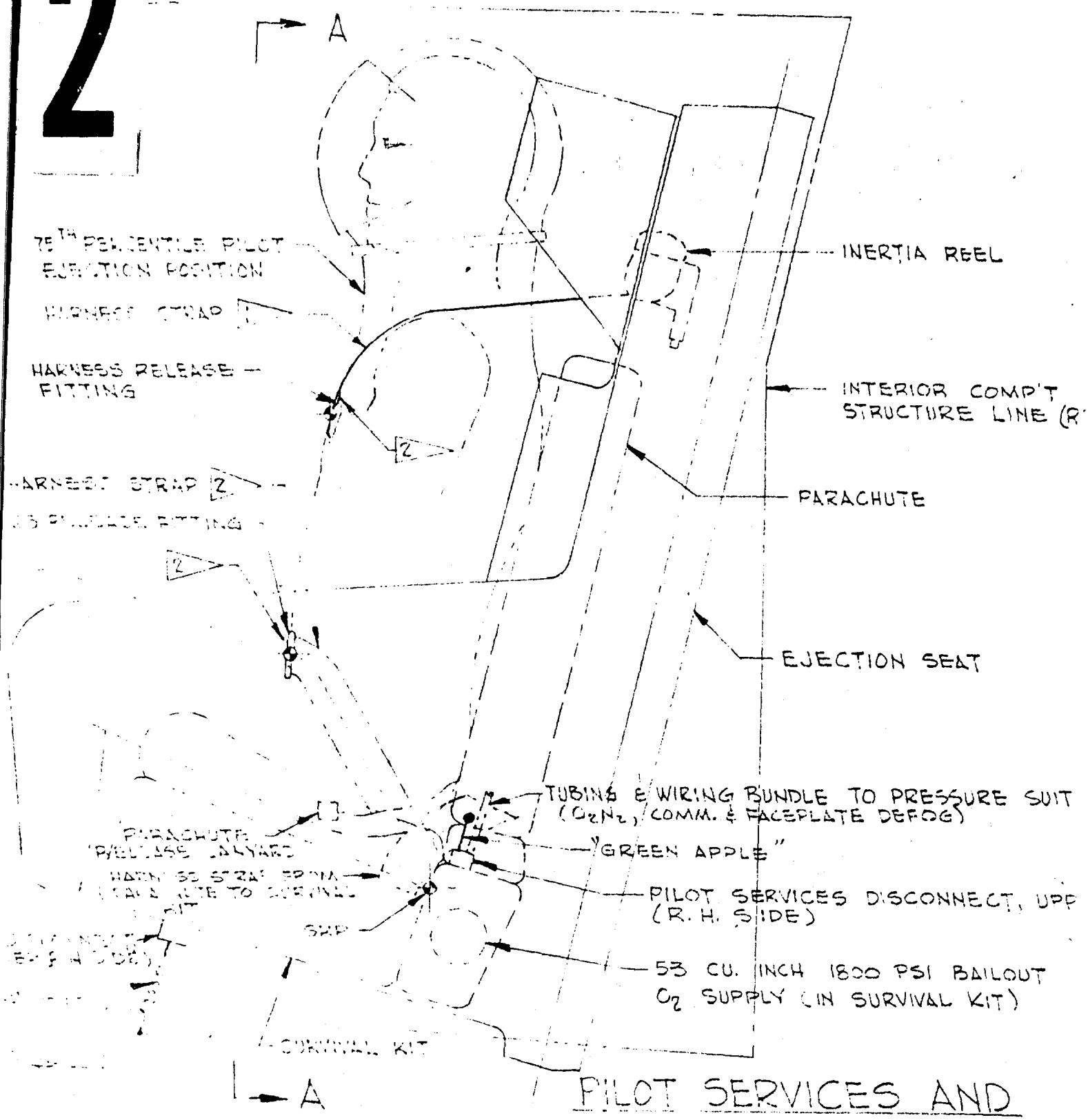


SECTION A-A

REV H

REVISED

2



PILOT SERVICES AND RESTRAINT REQUIREMENT

FIGURE 11

APPENDIX "B"

Heat Shield Sled Test Requirements

1.0 Forward

While in no way part of the escape system, the windshield heat shield will be qualification tested in this sled program, due to the similarity of test procedures and to take advantage of the available test vehicle, facilities, instrumentation, test personnel and compatible time scale.

2.0 Test Objective

The objective of this test is to verify that the heat shield jettison system will accomplish design requirements under specified vehicle dynamic conditions.

The following items shall be demonstrated at ground velocities producing "g" loads representative of the most severe actual loads which may be encountered during the X-20 flight.

a. Demonstrate that the heat shield jettison mechanism operates within the limits predicted for dynamic conditions existing at the time of actuation and that the heat shield separates from the glider with no damage to the portion of the hinge remaining with the glider.

b. Correlate heat shield release and jettison trajectory data with values predicted for actual in-flight operation. The heat shield shall move upward and aft after separation, shall clear all glider structure and shall contact the ground behind the glider.

c. Demonstrate that wedging of the waterwall against the heat shield hinges does not impair separation of the heat shield from the hinges.

3.0 Test Configuration

Production heat shields and water walls shall be installed on the test sled for the heat shield jettison runs.

A production actuation system shall be installed. This system utilizes bottle-stored nitrogen gas released by means of a solenoid controlled valve through high pressure tubing and flexible hose to the linear pneumatic actuator. No arming device is required; however, in the interest of safety, a ground safety device is incorporated into the control system.

4.0 Test Conditions

Heat shield jettisoning will be tested on two sled runs. A third run will be held in reserve for contingencies and will be conducted only if the required qualification results are not obtained during the first two runs. The desired jettison velocity is 335 to 350 knots at standard sea level atmospheric conditions. Velocity shall not be